## 3.3 TOWERS

The towers shall be of following types:-

a) Double circuit (DA, DB, DC & DD type) of HVPN's KRR Design for both 0.4sq" ACSR Zebra and 0.2sq" ACSR Panther.

b) Single Circuit (A, B,C & D ) of 0.4sq" ACSR Zebra to be designed by the Bidder. The towers are of self supporting lattice steel type, designed to carry the line conductors with necessary insulators, earthwire and all fittings under all loading conditions.

The tower shall be fully galvanized structure.

New Design 132kV S/C towers and 132kV D/C KRR Design towers to be fabricated shall have a combination of two grades of steel, as detailed in structural drawings/bill of material. One is MS steel and other is HT steel conforming to IS:2062.

### 3.3.1 TYPE OF TOWERS

The towers are classified as given below for 132 KV lines.

**A) FOR KRR Design D/C Towers:-**

| Type of Tower | Deviation limit | Typical use |
|---|---|---|
| DA | 0 deg.-2 deg. | To be used as tangent tower. |
| DB | 2 deg.-15 deg. | a) Tension towers with tension insulators string.<br>b) Tension towers for uplift forces resulting from an uplift span upto 200 m.<br>c) Also to be designed for anti-cascading condition. |
| | 0 deg. | d) To be used as Section Tower |
| DC | 15 deg.-30 deg. | a) Tension towers with tension insulators string.<br>b) Tension towers for uplift forces resulting from an uplift span upto 200 m.<br>c) Also to be designed for anti-cascading condition. |
| DD | 30 deg.-60 deg. | a) Tension towers with tension insulators string.<br>b) Tension towers for uplift forces resulting from an uplift span upto 200 m.<br>c) Dead end with 0 deg. to 15 deg. deviation both on line and substation side (slack span). |

| | | |
|---|---|---|
| | **55 deg** | d) When DD type tower used with **+12m to +25m** Extension by restricting the span to **250m.** |
| | | e) For river crossing anchoring with longer wind span with 0 deg. deviation on crossing span side and 0 to 30 deg. deviation on other side. |

## Table 3.3.1 Types of D/C Towers

*[https://www.electrical4u.com/electrical-transmission-tower-types-and-design/]*

**B) For New 132kV S/C towers of 0.4sq" ( to be designed by the Bidder):-**

| Type of Tower | Deviation limit | Typical use |
|---|---|---|
| A | 0 deg.-2 deg. | To be used as tangent tower upto 2 deg. deviation |
| B | 0 deg.-15 deg. | a) To be used for line Angle deviation from 0 to 15 Deg.<br>b) Tension towers for uplift forces resulting from an uplift span upto 200 m.<br>c) Also to be designed for anti-cascading condition. |
| | 0 deg. | d) Section tower. |
| C | 15 deg.-30 deg. | a) To be used for line Angle deviation from 15 to 30 Deg.<br>b) Tension towers for uplift forces resulting from an uplift span upto 200 m.<br>c) Also to be designed for anti-cascading condition. |
| D | 30 deg.-60 deg. | a) To be used for line Angle deviation from 30 deg. to 60 Deg.<br>b) Tension towers for uplift forces resulting from an uplift span upto 200 m.<br>c) Complete Dead end with 0 deg. to 15 deg. deviation both on line and gantry side (slack span). |
| | 0 deg. | d) For river crossing anchoring anchoring with longer wind span with 0 deg. deviation on crossing span side and 0 to 30 deg. deviation on other side. |

## Table 3.3.1 Types of S/C Towers

*[https://www.electrical4u.com/electrical-transmission-tower-types-and-design/]*

## 3.3.2 LINE SUPPORTS

The supporting structures for overhead line conductors are various types of poles and towers called line supports. In general, the line supports should have the following properties :

(i) High mechanical strength to withstand the weight of conductors and wind loads etc.

(ii) Light in weight without the loss of mechanical strength.

(iii) Cheap in cost and economical to maintain.

(iv) Longer life.

(v) Easy accessibility of conductors for maintenance.

The line supports used for transmission and distribution of electric power are of various types including wooden poles, steel poles, R.C.C. poles and lattice steel towers. The choice of supporting structure for a particular case depends upon the line span, X-sectional area, line voltage, cost and local conditions.

1. Wooden poles.

These are made of seasoned wood (sal or chir) and are suitable for lines of moderate X-sectional area and of relatively shorter spans, say upto 50 metres. Such supports are cheap, easily available, provide insulating properties and, therefore, are widely used for distribution purposes in rural areas as an economical proposition. The wooden poles generally tend to rot below the ground level, causing foundation failure. In order to prevent this, the portion of the pole below the ground level is impregnated with preservative compounds like creosote oil. Double pole structures of the 'A' or 'H' type are often used (See Fig. 8.2) to obtain a higher transverse strength than could be economically provided by means of single poles.

The main objections to wooden supports are :

(i) tendency to rot below the ground level

(ii) comparatively smaller life (20-25 years)

(iii) cannot be used for voltages higher than 20 kV

(iv) less mechanical strength and (v) require periodical inspection.

2. Steel poles.

The steel poles are often used as a substitute for wooden poles. They possess greater mechanical strength, longer life and permit longer spans to be used. Such poles are generally used for distribution purposes in the cities. This type of supports need to be galvanised or painted in order to prolong its life. The steel poles are of three types *viz.*,

(*i*) rail poles

(*ii*) tubular poles and

(*iii*) rolled steel joints.

3. RCC poles.

The reinforced concrete poles have become very popular as line supports in recent years. They have greater mechanical strength, longer life and permit longer spans than steel poles. Moreover, they give good outlook, require little maintenance and have good insulating properties. The holes in the poles facilitate the climbing of poles and at the same time reduce the weight of line supports. The main difficulty with the use of these poles is the high cost of transport owing to their heavy weight. Therefore, such poles are often manufactured at the site in order to avoid heavy cost of transportation.

4. Steel towers.

In practice, wooden, steel and reinforced concrete poles are used for distribution purposes at low voltages, say upto 11 kV. However, for long distance transmission at higher voltage, steel towers are invariably employed. Steel towers have greater mechanical strength, longer life, can withstand most severe climatic conditions and permit the use of longer spans. The risk of interrupted serivce due to broken or punctured insulation is considerably reduced owing to longer spans. Tower footings are usually grounded by driving rods into the earth. This minimises the lightning troubles as each tower acts as a lightning conductor.